CLAIMS

1. A power supply for a device which has a load, comprising:

a first resonant generator and a second resonant generator, coupled in parallel, each generator having a phase output;

a control circuit coupled to the first and second generators controlling the first and second phase outputs;

wherein the first phase output and the second phase output are summed to provide a variable power supply to the load.

2. The power supply as claimed in claim 1, wherein the load is a medical device.

3. The power supply as claimed in claim 1, wherein the load is an X-ray generator.

4. The power supply as claimed in claim 1, wherein the load is a computer.

5. The power supply as claimed in claim 1, wherein the power supply is a high-voltage power supply.

6. The power supply as claimed in claim 1, wherein the power supply is a low-voltage power supply.

7. The power supply as claimed in claim 1, wherein the control circuit comprises a control signal generator.

8. The power supply as claimed in claim 7, wherein the control signal generator is a voltage controlled oscillator.

9. The power supply as claimed in claim 7, wherein the control circuit comprises a clock signal generator having a clock output, wherein the clock output is coupled to the first generator, and the clock output is coupled to the second generator through the control signal generator.

10. The power supply as claimed in claim 3, wherein the X-ray generator comprises a frequency oscillator generating an oscillator frequency, a plurality of magnetically coupled inverter modules for receiving the oscillator frequency, the plurality of inverter modules coupled to a plurality of resonant circuits, and an X-ray generating source.

11. The power supply as claimed in claim 10, wherein the plurality of inverter modules receive at least one clock input having the same frequency.

12. The power supply as claimed in claim 11, wherein the at least one clock input comprises a plurality of clock inputs at the same frequency and at least two clock inputs having different phases.

13. A method for controlling first and second generators connected in parallel, each generator having a phase output, the method comprising the steps of:

setting a first phase to the output of the first generator;

setting a second phase to the output of the second generator; selectively

shifting at least one phase output of the generators for achieving a predetermined magnitude of a voltage in a predetermined time.

14. The method as claimed in claim 13, further comprising the step of summing the first and second phase outputs.

15. The method as claimed in claim 13, wherein the first and second generators are resonant generators.

16. An apparatus for supplying operating power to an X-ray generating source comprising:

a frequency oscillator mechanism generating an oscillator frequency;

a plurality of magnetically coupled inverter modules for receiving the oscillator frequency, the plurality of inverter modules coupled to a plurality of resonant circuits, wherein the resonant circuit includes an inductor mechanism, a voltage limiting mechanism, and a resistor mechanism; and

an X-ray generating source.

17. The apparatus as claimed in claim 16, wherein the plurality of inverter modules are connected in parallel.

18. The apparatus as claimed in claim 16, wherein the plurality of inverter modules are connected in series.

19. The apparatus as claimed in claim 16, wherein the plurality of inverter modules are connected in parallel and in series.

20. The apparatus as claimed in claim 17, wherein the plurality of inverter modules receive at least one clock input having the same frequency.

21. The apparatus as claimed in claim 16, wherein the inductor mechanism, the voltage limiting mechanism, and the resistor mechanism are connected in parallel.

22. The apparatus as claimed in claim 16, wherein the inductor mechanism, the voltage limiting mechanism, and the resistor mechanism are connected in series.

23. The apparatus as claimed in claim 16, wherein the apparatus uses any of a gaseous, liquid, and solid insulating material.

24. The apparatus as claimed in claim 23, wherein the solid insulating material includes a thermosetting compound.

25. The apparatus as claimed in claim 24, wherein the thermosetting compound is doped with a thermally conductive filler material.

26. The apparatus as claimed in claim 25, wherein the thermally conductive filler material includes aluminum oxide.

27. The apparatus as claimed in claim 17, further comprising a power balancing mechanism.

28. The apparatus as claimed in claim 17, further comprising at least one step-up transformer coupled to the plurality of inverter modules.

29. The apparatus as claimed in claim 28, wherein each inverter module has at least one output, each output coupled to a primary winding of the at least one step-up transformer.

30. The apparatus as claimed in claim 28, wherein the resistor mechanism is a primary winding of the at least one step-up transformer.

31. The apparatus as claimed in claim 16, wherein the resistor mechanism has an impedance due to the load inherent in the X-ray source.

32. The apparatus as claimed in claim 16, further comprising a high-voltage rectifier stack having a plurality of multiplication modules, each multiplication module having an AC input and a DC output.

33. The apparatus as claimed in claim 32, wherein the AC inputs of the multiplication modules are connected in parallel.

34. The apparatus as claimed in claim 32, wherein the DC outputs of the multiplication modules are connected in series.

35. The apparatus as claimed in claim 33, wherein the parallel connections of the multiplication modules are through at least one coupling voltage limiting device.

36. The apparatus as claimed in claim 32, wherein the plurality of multiplication modules comprise an output filter voltage limiting device across each DC output of the multiplication modules.

37. The apparatus as claimed in claim 36, wherein a capacitance of the coupling voltage limiting devices is at least less than a capacitance of the output filter voltage limiting devices connected across the DC outputs of the multiplication modules connected in parallel.

38. The apparatus as claimed in claim 32, wherein the plurality of multiplication modules comprises a full-wave bridge.

39. The apparatus as claimed in claim 38, wherein the full-wave bridge includes a four diode bridge.

40. The apparatus as claimed in claim 35, wherein the plurality of multiplication modules further comprises a DC return resistor mechanism across at least one of the coupling voltage limiting devices.

41. The apparatus as claimed in claim 17, wherein the resonant inverters each have a phase output, and the apparatus further comprises a control circuit coupled to the resonant inverters controlling the phase outputs; wherein the phase outputs are summed to provide a variable power supply to the X-Ray generating source.

42. The apparatus as claimed in claim 16, further comprising a DC bus, wherein the DC bus includes a power limiting circuit to limit voltage supplied to the plurality of resonant inverter modules to operate in a reduced power mode.

43. An apparatus for supplying operating power to a load device comprising:

a frequency oscillator mechanism generating an oscillator frequency;

a plurality of magnetically coupled inverter modules for receiving the oscillator frequency, the plurality of inverter modules coupled to a plurality of resonant circuits, wherein the resonant circuit includes an inductor mechanism, a voltage limiting mechanism, and a resistor mechanism, wherein the plurality of inverter modules are each coupled to at least one transformer device, the transformer device having a primary winding and a secondary winding;

at least one DC voltage rectifier mechanism; and

a load sharing mechanism to substantially equalize the power load on each resonant inverter module.

44. The apparatus as claimed in claim 43, wherein the load sharing mechanism comprises a magnetic coupling between the primary windings of the plurality of inverter modules.

45. The apparatus as claimed in claim 43, wherein the equal load sharing mechanism comprises a tertiary winding wound bifilarly with the primary winding of the transformer of the resonant inverter module.

46. The apparatus as claimed in claim 45, wherein the tertiary windings are connected in parallel.

47. The apparatus as claimed in claim 45, wherein the tertiary windings have the same number of turns as the primary windings.

48. The apparatus as claimed in claim 43, wherein the equal load sharing mechanism further includes a second primary winding, wherein the second primary winding is electrically insulated from the first primary winding of the transformer of the resonant inverter module.

49. The apparatus as claimed in claim 43, wherein the equal load sharing mechanism electrically magnetically connects the primary windings in parallel but leaves the electrical circuit of the resonant inverter modules electrically open.

50. The apparatus as claimed in claim 43, wherein the plurality of inverter modules may be selectively disconnected from the electrical circuit.

51. The apparatus as claimed in claim 50, further comprising a timing mechanism that periodically disconnects at least one of the plurality of inverter modules.

52. The apparatus as claimed in claim 43, wherein the apparatus is tolerant of resonant inverter module failure due to substantially equalizing of the load between the at least one remaining inverter module by the load sharing mechanism.

53. The apparatus as claimed in claim 43, further comprising a power balancing mechanism.

54. An apparatus for supplying operating power to a load device comprising:

a frequency oscillator mechanism generating an oscillator frequency;

a plurality of magnetically coupled inverter modules for receiving the oscillator frequency, the plurality of inverter modules coupled to a plurality of resonant circuits, wherein the resonant circuit includes an inductor mechanism, a voltage limiting mechanism, and a resistor mechanism, wherein the plurality of inverter modules are each coupled to at least one transformer device, the transformer device having a primary winding and a secondary winding;

at least one DC voltage rectifier mechanism; and

means for sharing the load of the load device substantially equally between the plurality of resonant inverter modules.

55. In a system for generating X-ray beams utilizing a plurality of inverter modules, a method for controlling power comprising the steps of:

arranging the plurality of inverter modules coupled by at least one magnetic coupling; and

selectively disconnecting at least one module from the magnetic coupling.

56. The method as claimed in claim 55, further comprising the step of substantially equalizing a power load across the at least one magnetically coupled inverter module.

57. In a system for generating X-ray beams utilizing a plurality of inverter modules, a method for dissipating heat comprising the steps of:

arranging the plurality of inverter modules coupled by at least one magnetic coupling; and

selectively disconnecting at least one module from the magnetic coupling.

58. The method as claimed in claim 57, further comprising the step of substantially equalizing a power load across the at least one magnetically coupled inverter modules.

59. An apparatus for supplying operating power to an X-ray generating source, comprising:

a transistor switching control circuit comprising a slew rate detecting circuit, a variable delay circuit, and a feed back loop coupling the slew rate detecting circuit to the variable delay circuit.

60. In a system for generating X-ray beams, a method comprising the steps of:

sensing a slew rate;

generating a delay time for switching transistors based on the sensed slew rate; and

switching the transistors, wherein the transistors invert a current.

61. The method as claimed in claim 60, wherein the generated delay time is variable.

62. The method as claimed in claim 60, further comprising the step of:

initiating a wave-form coupled through a resonant circuit in the apparatus and wherein the slew rate is of the initiated wave form.

63. A shielded resistor circuit comprising:

a resistor mechanism having opposing end terminals; and

a shield for limiting electrical noise from interfering with the operation of the resistor mechanism, the shield including;

a plurality of paired conductive members disposed along the length of the resistor mechanism and having opposing end terminals, the pairs of conductive members separating the resistor mechanism into separate portions by providing alternating first and second pairs of conductive members along the length of the resistor mechanism;

a capacitor series comprising a plurality of serially connected capacitor mechanisms disposed a predetermined distance from the resistor mechanism and having opposing end terminals, each capacitor mechanism being connected between adjacent first and second pairs of conductive members being connected to the end terminals of the capacitor series, and the dynamic impedance of the capacitor series being less than the dynamic impedance of the resister mechanism;

a diode bridge series comprising a plurality of connected diode bridges coupled to the capacitor series;

wherein when the end terminals of the resistor mechanism are connected between a higher-voltage potential and a lower voltage potential, and the end terminals of the capacitor series are connected between the higher-voltage potential and ground, electrical noise is coupled to the capacitor series and does not interfere with the resistor mechanism.

64. The circuit as claimed in claim 63, further comprising an inductor mechanism intercoupled with said capacitor mechanism for limiting the rate of change of a transient voltage to a predetermined value.

65. The circuit as claimed in claim 64, wherein the inductor mechanism is a series of serially connected resistor mechanisms, the resistor mechanisms having a stray inductance.

66. The circuit as claimed in claim 64, wherein the diode bridges are serially connected, each of the diode mechanisms being connected in parallel with one of the capacitor mechanisms for preventing the voltage across the resistor mechanism from reversing polarity.

67. The circuit as claimed in claim 63, wherein each diode bridge has a DC output and an AC input, wherein the DC outputs are connected in series and the AC inputs are connected in parallel to an AC source.

68. The circuit as claimed in claim 67 wherein the AC inputs to the AC source are through the capacitor series.

69. A shielded resistor circuit comprising:

a first insulating sheet and a second insulating sheet each having opposing inner and outer faces, the sheets being disposed in parallel with their inner faces adjacent one another, a resistor mechanism disposed between the inner faces;

a first series of paired conductive members disposed adjacent the resistor mechanism, each pair of the first series comprising a first member disposed on one of the inner faces and a second member disposed on the outer face opposing the other inner face, and means for connecting the first and second members;

a second series of paired conductive members disposed adjacent the resistor mechanism, each pair of the second series comprising a third member disposed on the outer face opposing the one inner face and a fourth member disposed on the other inner face, and means for connecting the third and fourth members, each pair of the second series being disposed between two pairs of the first series, the combined first and second series having opposing end terminals;

a capacitor series comprising a plurality of serially connected capacitor mechanisms disposed between the inner faces a predetermined distance from the resistor mechanism and having opposing end terminals, each capacitor mechanism being connected to an adjacent pair of the first series and pair of the second series, the end terminals of the conductive members being connected to the end terminals of the capacitor series, and the dynamic impedance of the capacitor series being less than the dynamic impedance of the resistor mechanism;

a diode bridge series comprising a plurality of connected diode bridges coupled to the capacitor series;

wherein the end terminals of the resistor mechanism are connected between a higher-voltage potential and a lower-voltage potential, and the end terminals of the capacitor series are connected between the higher-voltage potential and ground, electrical noise is coupled to the capacitor series and does not interfere with the resistor mechanism,

70. An X-ray generating source and regulated power supply comprising:

an X-ray generating source;

a regulator circuit which receives an input signal and regulates at least one of a duration and an amplitude of the input signal to produce a high-voltage output signal for operating the X-ray generating source; and

a protection circuit disposed between the regulator circuit and the X-ray generating source for limiting a rate of change of a transient voltage spike produced at the source to a predetermined value and protecting the regulator circuit, wherein the protection circuit comprises a plurality of series connected resistor mechanisms coupled to the source of the transient high-voltage spike, the resistor mechanisms having a stray inductance.

71. The apparatus of claim 70, wherein the resistor mechanisms are intercoupled with a high-voltage clamping mechanism.

72. The apparatus of claim 71, wherein the high-voltage clamping mechanism comprises a plurality of series connected voltage-limiting devices in parallel with the resistor mechanisms.

73. The apparatus of claim 72, wherein the voltage limiting devices comprise solid-state current conducting devices.

74. The apparatus of claim 70, wherein the protection circuit further comprises means for preventing the high-voltage spike from reversing polarity.

75. The apparatus of claim 74, wherein the preventing means includes a diode mechanism for preventing a voltage across the regulator circuit from reversing polarity.

76. The apparatus of claim 75, wherein the preventing means further includes at least one voltage limiting device connected in parallel with the diode mechanism.

77. The apparatus of claim 75, wherein the diode mechanism comprises a plurality of series connected diode bridges.

78. The apparatus of claim 77, wherein the plurality of diode bridges are four-diode bridges.

79. The apparatus of claim 77, wherein the plurality of diode bridges have a DC output and an AC input, wherein the DC outputs are connected in series and the AC inputs are connected in parallel to an AC source.

80. The apparatus of claim 79, wherein the parallel connections of the AC inputs to the AC source are through coupling voltage limiting devices.

81. The apparatus of claim 80, wherein at least one DC return resistor mechanism is provided across at least one of the coupling voltage limiting devices.

82. The apparatus of claim 70, wherein the protection circuit does not comprise a resonant circuit.

83. A transformer device comprising:

a single core comprising a substantially rectangular-shaped magnet having four sides, wherein each side is a section of the rectangular-shaped magnet;

two primary windings, each primary winding mounted on the core on opposing sides of the magnet; and

two secondary windings, each secondary winding mounted on the core on one of the same opposing sides of the magnet.

84. The transformer device as claimed in claim 83, wherein the power through the transformer is balanced between the two opposing sides.

85. The transformer as claimed in claim 83, further comprising a tertiary winding mounted on each of the two primary windings.

86. The transformer as claimed in claim 83, further comprising an insulating compound between each pair of the primary and secondary windings.

87. The transformer as claimed in claim 83, wherein the two primary windings are coupled in parallel.

88. The transformer as claimed in claim 85, wherein the two tertiary windings are coupled in parallel.

89. A transformer device for an X-ray generating device, comprising:

a single core comprising a substantially rectangular-shaped magnet having four sides, wherein each side is a section of the rectangular-shaped magnet; two primary windings, each primary winding mounted on the core on opposing sides of the magnet; and

two secondary windings, each secondary winding mounted on the core on one of the same opposing sides of the magnet.